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BOOK REVIEW

Direct Nuclear Reactions
(Proceedings of the International Seminar, Bangalore, Jan 12–16, 1989)
edited by N G Puttaswamy
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This volume contains the proceedings of the International Seminar on Direct Nuclear Reactions' held in Bangalore during January 12–16, 1989.

The subject of Direct Nuclear Reactions' has been developing in many directions in recent times. In this book, the current trends in the experimental and theoretical aspects of direct nuclear reactions initiated by light and heavy ions, have been covered in a comprehensive manner through 36 invited talks. These are distributed under six sections : nuclear reactions at high energies, heavy-ion reactions, elastic scattering, inelastic scattering and charge-exchange reactions with light ions, transfer reactions-experimental and theoretical, and knock-out, break-up and fragmentation reactions.

In the first section, 'Nuclear reactions at high energies', Henry D Holmgreen has presented detailed discussion of the proposed experimental facilities and research plans at the CEBAF to be completed in 1994 to study the various aspects of the structure of the nucleus. The paper is a source of information to the interested nuclear physicist. J Pasupathy has analysed the strange quark contribution to mass and angular momentum of the proton in quantum chromodynamics. Pion-nucleus elastic scattering in the distorted wave impulse approximation has been discussed by R Subramanian *et al.* N Sarma has discussed nucleon collision at high energy.

In the next section, the various aspects of heavy-ion reactions are well-represented through the nine contributions. Experimental study of heavy ion collisions with reference to low energy quasi-elastic reactions (J S Lilley), the effect of static deformation on the elastic, inelastic and fusion reactions (M A Nagrajan), high lying collective and single particle modes via heavy ions at intermediate energies (Gales and Fortier), dynamics of asymmetric heavy ion reactions between 10 and 30 Mev/A (R Kollinski *et al*), spin alignment in heavy ion inelastic scattering (R Singh), fusion process in HI collisions (Sahu and Sastry) are some of the topics discussed. Sperber and Stryjewski have dealt with fragment characteristics in heavy

ion scattering using a classical dynamical model where deformations and deformation-dependent collective inertias in both the entrance and the exit channels have been rigorously treated.

Under the section elastic scattering, inelastic scattering and charge exchange reactions with light ions—B Baliga has given an overview of the experiments done at VEC project, Calcutta using α-particles. High resolution studies of (p,n) and (p,p') reactions on p- and s,d-shell nuclei are discussed by Ohnuma and Orihara. Topics such as charge exchange reactions at intermediate energies promoting collective spin-isospin-excitations in nuclei (Osterfeld), new properties of giant resonances in highly excited nuclei (Morsch), multistep reaction theory (Hodgson) have been covered.

The section involving transfer reactions with light ions contains seven papers dealing with experimental aspects and six papers concerning theoretical aspects. N G Puttaswamy has reviewed the recent work on the generation of shell model potential from the extrapolation of optical potential determined at positive energies using a dispersion relation. Direct transfer of large cluster at sub-Coulomb energies (Eswaran), creation of high spin states at high excitations in light nuclei through (α,p) reaction (Brown) have been discussed. S N Chintalapudi has reviewed in details the direct reaction studies done at VEC, Calcutta since 1982 using α-particle as the projectile. The review will interest nuclear physicists intending to use the facilities at VEC.

On the theoretical aspects of transfer reactions, VKB Kota has analysed data concerning single nucleon transfer strengths via IBM and statistical averaging theory. S N Mukherjee and G H Rawitscher have presented a detailed review of the current status of spin-dependent discretized continuum coupled channel model for nuclear reactions initiated by light and fragile ions (deuteron, lithium) at intermediate energy. New theoretical developments in deuteron induced stripping and pick-up reactions (S Mukherjee and S Chakravorty) and polarization phenomena in nuclear reactions (G Ramachandran) are some other contributions

In the section on konck-out, break-up and fragmentation reactions, B Kuehn has reviewed the knock-out of clusters and particle emission in nucleon-nucleus collision at intermediate and high energies. The production of pions and other particles and the quark degrees of freedom in the short-range correlations are also included. Theories of projectile break up reactions and applications in nuclear astrophysics have been discussed by R Shyam. V P Viyogi *et al* have reported experiments using 60–70 Mev α-particle beam delivered at VEC, Calcutta on ^{27}Al target. The phenomenological analysis of energy spectra and production cross sections of fragments indicated interesting finding.

Besides, the invited papers are included summaries of the two discussion sessions · one on 'Heavy-ion reactions' (R H Siemssen) and another on 'Absolute spectroscopic factors' (H Nann).

There are also 12 contributed papers. These represent to a good measure the research activity in our country in this field.

The book is an exhaustive collection of reviews and papers on the various aspects of direct nuclear reactions. The articles are mostly well-written and indicate a high level of presentation. The presence of many contributions by foreign experts in the proceedings truly demonstrate the international character of the seminar.

The present volume will be welcomed as a standard source of reference on the current trends of 'Direct nuclear reactions' by the community of nuclear physicists. The book will be useful to the active researcher in this field. The Indian Academy of Sciences, Bangalore ought to be thanked for bringing out this commendable publication.

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